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ABSTRACT

This paper addresses classroom design trends and the key issues schools should consider for better classroom space flexibility and adaptability. Classroom space design issues when schools embrace technology are discussed, as are design considerations when rooms must accommodate different grade levels, the importance of lighting, furniture considerations, and classroom size ratios and partition arrangement. Final comments highlight classroom design principles that are considered important for all classrooms at all grade levels, such as outdoor accessibility, clustering, the fostering of creativity and student engagement, and classroom adaptability. (Contains 19 references.) (GR)

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ED 446 421

Classrooms

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How we design a classroom makes a powerful statement about how we view education. Whether a classroom has straight rows of desks or is filled with sofas and computer workstations tells us much about how teaching occurs, how learning takes place, and to what extent students are engaged in their studies. As educators come to view learning as an active process of engagement, classroom design is being reexamined.

Educational Trends

Educational reformers have tinkered with classroom design throughout the history of public education. At the turn of the 20th century, educators devised the Lancastrian system, using bleacher-style seating and sloped floors to aid the teacher's supervision of the classroom. By the 1920s, however, today's standard, rectangular classrooms had become almost universal. They have remained so, with the exception of the open classrooms used in some schools in the 1970s (Tyack and Cuban 1995: chapter 1).

Now some educational theorists advocate a different approach. "Classrooms are out! Don't build them," argues Roger Schank of Northwestern University's Institute for Learning Sciences. "[W]e should spend about 1/3 of our day at the computer, 1/3 talking with others, and 1/3 making something" (Fielding 1999). Architects and educators have created multiple variations on this theme. Some have endorsed the personal workstation, rather than the classroom, as the basic educational unit, while others have reconfigured classrooms into Z shapes, L shapes, and off-centered shapes (Dyck 1997: 40). Classrooms have been placed in zoos, museums, and professional office buildings, and have even disappeared in the virtual, Internet-based school (Jilk 1999: 46–48).

These various alternatives are all based in research supporting the idea that children learn best when learning is active and student-centered rather than passive and teacher-centered. Architect Steven Bingler believes that one of the most important educational trends is replacing "the old factory model of education with a studio model in which students work independently or in small, problem-solving groups" (Bingler 1998: 16–17; see also Taylor and Vlastos 1975: chapter 1). Advocates of classroom teaching, while still making use of the lecture and didactic method, have come to view project-based and cooperative learning as integral components of education.

Key Issues of Classroom Spaces

Classrooms accommodate a wide range of activities: individual study, one-on-one discussions (with a teacher or another student), small group work, large group work, and teacher-directed instruction or lecture. A classroom may be used by a single teacher, by several teachers throughout the day, or may be reconfigured through moving walls to allow for team-teaching or multiclass projects. The need to accommodate diverse options places a premium on the flexibility and adaptability of the classroom.

Technology. Schools have embraced technology to transform learning. By enhancing individualized instruction and providing access to enormous amounts of data, technology has altered how teachers teach and students learn. Schools now commonly use a wide range of technologies in the classroom, including laptop computers, the Internet, e-mail, video communication via tape or broadcast, networked printers, and library file servers. The availability of videos and cameras has also made distance learning feasible for many schools.

The expanded presence of technology in the classroom has also affected how classrooms are designed. The impact ranges from putting a greater load on HVAC systems to the security and maintenance of computers and peripherals. In general, the effects of technology on classroom design include

- providing additional space for computer workstations (15–20 sq. ft. per station), wall- or ceiling-mounted TV and VCR, and a video projection system.
- adding wiring for voice, video, and data capabilities. Wiring should be accessible to deal with upgrades, and electrical outlets and data drops should be ample for the classroom (Tenbusch and Vaughan 1998). Given the advances in technology and the rapid increase in wireless communication (NSF 1999),

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much of the wiring in the classrooms may quickly become outdated. Consideration should therefore be given to both wireless and wired communication.

Differences between grade levels. Traditionally, elementary school classrooms have larger rooms and more differentiated spaces (e.g., quiet areas, wet areas) to accommodate young children's need for movement and exploration. The move towards more activity-based and individualized instruction throughout the upper grades, though, has made these features more common in middle school and high school classrooms.

Depending on the grade level and local policies and building codes, the size of the classroom can vary greatly, ranging from 750 to 1200 square feet (Minnesota Department of Children, Families, and Learning 1997; *School Planning and Management* 1997). In general, consider adding at least 15 percent more square feet per classroom for expanded technology needs, a highly project-centered curriculum, and inclusion of special needs students.

Lighting. Research has consistently shown that academic off-task behavior, absences, and depression all decrease with greater amounts of natural light. In North Carolina, for example, the state board of education recommends that the area allocated for windows in elementary school classrooms be equivalent to at least eight percent of the total floor space. For middle schools and high schools the recommendation is between six and eight percent (North Carolina State Board of Education 1998).

It is also important to use a combination of indirect and task lighting or consider newer direct/indirect lighting systems to enhance illumination levels for reading and to reduce glare on computer monitors. Adjustable lighting controls provide greater options in lighting levels throughout the classroom. In addition, all windows and skylights should be equipped with blinds.

Consideration should also be given to energy efficiency. Energy-efficient light fixtures, motion detectors that turn on and off classroom lights based on movement, and electronic daylight sensors that decrease illumination levels when natural light increases can have a long-term impact on maintenance and energy costs (EPA 1999; McDaniel 1999).

Furniture.

- **Student desk.** The student's desk is often seen as the most important piece of furniture in the classroom. Because students work individually at their desks or rearrange them to form small groups or distinct seating arrangements, consider procuring desks with portable drawers so students can easily move about with their belongings.
- **Chair.** Most classroom chairs are nonadjustable and research shows that individuals cannot sit still and concentrate for more than 50 minutes in nonadjustioned chairs (Bullock and Foster-Harrison 1997: 39). Ergonomically designed, padded, and adjustable chairs can accommodate individuals of varying sizes and provide comfort for a wide range of uses, which is particularly important as extended computer use increases. This dichotomy between practice and research is largely due to budgetary constraints.
- **Table.** Tables are excellent for small and large group meetings, using manipulatives (blocks and plastic tools children use to learn math principles), and project-centered work. Tables should be adjustable in height (between 23 and 31 inches); if this is not feasible, tables of different heights should be spread throughout the room.
- **Computer workstation(s).** As computers become more common in classrooms, clustering workstations in carrels (be they triangular, square, or hexagonal) often saves floor and furniture space. Surrounding the workstation with low partitions promotes privacy, reduces unwanted glare on the monitor, and dampens noise (Green *et al* 1996; Maxwell 1999).
- **Display and storage area(s).** Wall displays are an important personalizing feature of a classroom. Bulletin boards, white boards, and display cabinets add color and diversity while reducing acoustical reverberations. Storage space should be plentiful. While some permanent cabinetry is necessary, movable modular cabinetry is preferable. Movable and lockable storage spaces allow students and teachers greater flexibility in classroom activities.
- **Teacher desk.** Some designers contend the teacher's desk should be on the periphery of or outside the classroom altogether. In general, the teacher's desk should have ample, lockable storage space and allow for a computer and modem connection.

Room as a whole. The length-to-width ratio of a classroom should be no greater than three-to-two (3:2). Ceiling heights should be a minimum of nine feet, preferably ten or more. Classrooms must be able to accommodate seating arrangements as varied as rows, small group clusters, or U-shapes. Partitions and furniture should not block students' views. Although movable or retractable walls can facilitate opportunities for team teaching or large group sessions with neighboring classrooms, the walls must be acoustically treated to provide adequate noise separation between teaching areas.

Given the move to activity-based and project-centered work, learning centers have become popular beyond the elementary school level. Centers for reading, science, art, or reference materials are not uncommon. Comfortable furniture, distinct boundaries, and the ability for individualized modification are key features in designing these centers. Lofts, which may be used in the upper elementary and middle school level and above, can add more than 100 square feet of space and provide a unique touch to the classroom. Finally, consider using carpeting and acoustical ceilings to reduce classroom noise levels (Acoustical Society of America 1999).

Principles of Classroom Design

Although the following key issues pertaining to classroom design are not comprehensive, classrooms at all grade levels should

- **be accessible to the outdoors.** Access to the outdoors allows nature to be incorporated into the curriculum and can serve as an alternative space for small and large group meetings. Visual access to the outdoors provides daylight, which enhances alertness and has psychological benefits such as relieving stress.
- **be clustered.** Classrooms can be clustered around a commons area, by grade level, by departmental area (for instance, a science wing), or near a facility such as the media center. Differentiated markings such as color coding, signage, or varied flooring materials (carpeting versus resilient flooring) can facilitate clustering. Clustering fosters a sense of community, unites a manageably sized group of teachers and students, and provides a sense of order and cohesiveness to the physical layout of the school.
- **foster creativity and engagement.** Research shows that students learn best in stimulating, safe, and resource-rich learning environments (Lackney 1998). Classrooms should have complementary colors, textures, and patterns. The distinctive architectural and visual design of the room can be incorporated into the curriculum through projects that are based on the notion of "classroom as textbook." There may be places for group and individual learning, including breakout spaces, alcoves, tables, and nooks and crannies. Resources areas should be within or as near to the classroom as possible. Finally, the classroom should allow students to create and modify their own personalized area. The perception of personal control lowers stress, enhances engagement, and provides a safe "home base" from which the student can explore (Finlik 1997: 41).
- **be adaptable.** The more flexible the classroom design, the better. A classroom must be able to accommodate the changes in technology and teaching strategies for several decades to come. Movable furniture and storage spaces, multiple electrical outlets, and adjustable lighting systems are just some of the factors that influence and expand how a classroom can be used.

It may be more useful to think of the classroom as a living room, interactive museum, or library—where knowledge is discussed and discovered—rather than a space where information is simply transferred from teacher to students. Educational designers have a duty to foster a creative and engaging learning environment. With the continued expansion of technology into the learning process, flexible and thoughtful classroom designs should be the rule rather than the exception.

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Additional Information

See the NCEF annotated bibliography Classroom Design, online at *http://www.edfacilities.org/ir/hottopics.cfm.*

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